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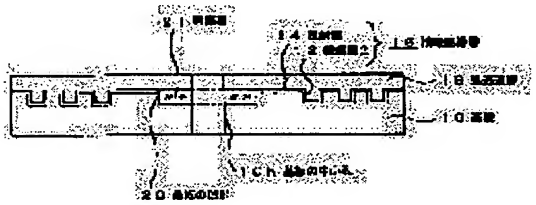
(54) METHOD AND DEVICE FOR PRODUCTION OF OPTICAL RECORDING MEDIUM

(57)Abstract:
PROBLEM TO BE SOLVED: To uniformalize the thickness of a light transmissive layer and to make recording high dense by applying an photosetting resin from the center part of rotation, spreading by the rotation and photosetting on a surface made flat by embedding a plugging plate in a center hole and a recessed part of the center part of a substrate.
SOLUTION: The substrate 10 is molded by injection-molding a polycarbonate and simultaneously fine ruggedness 12 and the circuit recessed part 20 of the substrate are formed. The recessed part 20 is set to, for example, 30 mm diameter and 0.3 mm depth. An information recording layer 15 is formed by adhering a reflecting layer 14 on the fine ruggedness by Al vapor deposition. The plugging plate 21 composed of the polycarbonate is inserted into the recessed part 20. In such a case, the thickness of the plugging plate 21 is set so that the upper surface of the inserted plugging plate 21 is leveled with the substrate or slightly projected over the substrate 10. The liquid photosetting resin is dropped on the center of the plugging plate 21 and is spread by the high speed rotation of the substrate 10. At the same time, the light transmissive layer 18 is formed by irradiating with ultraviolet ray and photosetting. The center hole 10h of the substrate is formed by punching the center part of the plugging plate 21.



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CLAIMS

[Claim(s)]
[Claim 1] The lock out plate which embeds this crevice in the above-mentioned crevice is inserted in using the substrate with which the crevice is formed in the periphery of a feed hole. By rotating the above-mentioned coalesce substrate for this photo-setting resin by dropping a photo-setting resin at the process used as a coalesce substrate, and the core of this coalesce substrate The manufacture approach of the optical record medium characterized by having the process which forms a light transmission layer by making it extend and carrying out photo-curing, and the process which a core is pierced [process] and makes a feed hole penetrate.
[Claim 2] The manufacture approach of the optical record medium according to claim 1 characterized by carrying out photo-curing of the photo-setting resin dropped at the core of the above-mentioned coalesce substrate to coincidence in the process which carries out rotation extension.
[Claim 3] The manufacture approach of the optical record medium according to claim 1 characterized by being inside the most inner circumference of the detailed irregularity from which the periphery of the crevice of the transparence substrate currently formed in the periphery of the above-mentioned feed hole constitutes the information record layer formed on the above-mentioned transparence substrate.
[Claim 4] The manufacture approach of an optical record medium according to claim 1 that the depth of the crevice of the transparence substrate currently formed in the periphery of the above-mentioned feed hole is characterized by being 0.3mm or less.
[Claim 5] The lock out plate which blockades the feed hole of this substrate is inserted in using the substrate which has a feed hole. By rotating the above-mentioned coalesce substrate for this photo-setting resin by dropping a photo-setting resin at the process used as a coalesce substrate, and the core of this coalesce substrate The manufacture approach of the optical record medium characterized by having the process made to extend, the process which removes the above-mentioned lock out plate during rotation of a coalesce substrate, and the process which forms a light transmission layer by carrying out photo-curing of the above-mentioned photo-setting resin.
[Claim 6] The manufacture approach of the optical record medium according to claim 5 characterized by adsorbing the above-mentioned lock out plate with a magnet in the process which removes the above-mentioned lock out plate.
[Claim 7] The manufacture approach of the optical record medium according to claim 5 characterized by carrying out photo-curing of the above-mentioned photo-setting resin, and forming a light transmission layer during rotation of a coalesce substrate after the process which removes the above-mentioned lock out plate.
[Claim 8] The manufacturing installation of the optical record medium which serves as a level pedestal which has the function to rotate a substrate horizontally, a lock out plate which blockades the feed hole of a substrate, and an electromagnet which has the function which carries out desorption of this lock out plate from a substrate from a lamp, and is characterized by considering the above-mentioned electromagnet and the nozzle which trickles a liquefied photo-setting resin on a substrate as the exchangeable configuration.

[Claim 9] The manufacturing installation of the optical record medium according to claim 8 characterized by the above-mentioned lock out plate being a magnetic material.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the manufacture approach of an optical record medium, and a manufacturing installation.
[0002]
[Description of the Prior Art] As an optical record medium which records the various information on the object for audios, and the object for videos and others Although there are optical record media, such as ROM (Read Only Memory) molds, such as an optical disk which performs the record or playback by optical exposure, an optical card, a magneto-optic disk, and a phase change optical record medium, a postscript mold, and a rewriting mold For example, detailed irregularity, such as a phase pit where record of the data information of the information record layer, a tracking servo signal, etc. is made in a ROM mold [as / in a compact disk], and PURIGURUBU, is formed by injection molding.
[0003] With increase-izing of the amount of recording information, high recording density-ization needed to be attained and numerical-aperture N.A. of the objective lens of an optical pickup needed to be enlarged as much as possible by this. Thus, since spacing of an objective lens and an information record layer needs to be selected small and the inclination tolerance of an optical record medium decreases in this case when enlarging numerical-aperture N.A. of an objective lens, the optical exposure to an information record layer will be made from the light transmission layer side formed on this, and, moreover, it will be necessary to set thickness of this light transmission layer to 0.5mm or less enough at smallness.
[0004] The outline sectional view of read-out of recording information or the optical record medium of a configuration of performing writing is shown from the light transmission layer [which was produced by the conventional process to drawing 20] side formed on the information record layer.
[0005] The optical record medium shown in drawing 20 has the configuration which the imprint of the detailed irregularity 2 was made while forming the substrate 1 with injection molding, and formed the reflective film 4 by aluminum vacuum evaporationo film to the detailed irregularity 2 after that, and formed the information record layer 5, and the thickness of 0.5mm or less formed light transmission layer 8 on the information record layer 5.
[0006] The production approach of the optical record medium shown in drawing 20 is shown below.
[0007] First, as detailed irregularity 2 is imprinted to shaping of a substrate 1 and coincidence by injection molding, next it is shown in drawing 21 , the light transmission layer 8 shown in drawing 20 is formed in the information record layer 5 forming-face side of a substrate 1 for the liquid photo-setting resin 3 from a nozzle 9 by applying circularly, extending by rotating a substrate 1 after that, and carrying out photo-curing of this.
[0008] The optical exposure of the read-out light L performs read-out of the information from the information record layer 5 to the optical record medium shown in this drawing 20 from the light transmission layer 8 side.
[0009]

[Problem(s) to be Solved by the Invention] As mentioned above, the liquid photo-setting resin 3 on a substrate 1 however, carry out rotation spreading circularly and for example, by carrying out photo-curing If the light transmission layer 8 is formed, the liquid photo-setting resin 3 inclines toward the outermost periphery on a substrate 1 according to a centrifugal force, thereby, as shown in drawing 20 , the outermost periphery on a substrate 1 will be thicker than the inner circumference section, the light transmission layer 8 will be formed, and an ununiformity will arise in the thickness of the light transmission layer 8.

[0010] Thus, if the thickness of the light transmission layer 8 becomes an ununiformity, in the case of record playback of the signal by the optical pickup of an optical record medium, it will become the cause which produces the aberration of a condensing spot, and degradation of a record regenerative signal will be produced.

[0011] Here, when applying a liquid photo-setting resin on a substrate, the relation between the distance (r0) from the substrate core of the spreading starting position of a photo-setting resin and distribution of the thickness of a light transmission layer is shown in drawing 22 . In measuring the relation between the distance (r0) from the substrate core of the spreading starting position of the photo-setting resin shown in drawing 22 , and distribution of the thickness of a light transmission layer, the distance (r0) from the substrate core of the spreading starting position of a photo-setting resin shows the distribution at the time of making it move at 5 (mm) spacing in 5-25 (mm). The photo-setting resin used SD-301 (Dainippon Ink make). Moreover, the rotation pattern of the substrate at the time of carrying out rotation extension of the photo-setting resin is shown in drawing 23 .

[0012] In drawing 22 , a curve 31 expresses distribution of the thickness (micrometer) of a light transmission layer in case the distance (r0) from the substrate core of the spreading starting position of a photo-setting resin is 5 (mm) here. a curve 32 -- r -- 0 = 10 (mm) and a curve 33 -- r -- 0 = 15 (mm) and a curve 34 -- r -- 0 = 20 (mm) and a curve 35 -- r -- distribution of the thickness of each light transmission layer at the time of 0 = 25 (mm) is expressed.

[0013] According to drawing 22 , it turns out that small distribution of the light transmission thickness difference of an inside-and-outside periphery is acquired, so that the spreading starting position (r0) of a photo-setting resin goes to the inner circumference side of a substrate. For example, the difference of the thickness in the inside-and-outside periphery of a light transmission layer in case a spreading starting position is 5 (mm) is set to 1 micrometer or less to the difference of the thickness in the inside-and-outside periphery of a light transmission layer in case a spreading starting position is 20 (mm) being 7 micrometers or more. Thus, the spreading starting position of a photo-setting resin is further brought to the inner circumference side of a substrate, when it is applying a photo-setting resin from the core of a substrate, a thickness difference twists a theory top and a plane light transmission layer will be obtained completely.

[0014] However, since there was a press slot by the stamper for the detailed irregularity imprint of an optical record medium which was produced on the occasion of the feed hole of a disk and injection molding of a substrate especially in the case of the optical disk, the spreading starting position of a photo-setting resin could not be made into the core of a substrate, but the outside of the press slot on the stamper was the limitation of the spreading starting position of a photo-setting resin. For this reason, unevenness was to arise in the thickness of a light transmission layer.

[0015] Then, in this invention, the optical record medium which avoided effectively as unevenness arose in the thickness of a light transmission layer by the ability making the spreading starting position of the photo-setting resin on a substrate at the time of forming a light transmission layer into the core of a substrate is produced.

[0016]

[Means for Solving the Problem] This invention inserts in the crevice of a substrate the lock out plate which embeds a crevice and is blockaded using the substrate with which the crevice is formed in the periphery of a feed hole. By considering as a coalesce substrate and a photo-setting resin being dropped at the core of this coalesce substrate, and making a photo-setting resin extend and carrying out photo-curing by rotating a coalesce substrate, form a light transmission layer, pierce a core, a feed hole is made

to penetrate, and an optical record medium is produced.
[0017] Moreover, by inserting a lock out plate in the feed hole of a substrate, considering as a coalesce substrate, a photo-setting resin being dropped at the core of this coalesce substrate, and carrying out rotation extension, removing a lock out plate during rotation of a coalesce substrate, and carrying out photo-curing of the photo-setting resin, this invention forms a light transmission layer and produces an optical record medium.
[0018] Since according to this invention a photo-setting resin is dropped, rotation spreading is carried out and a light transmission layer is formed in the core of a substrate by [the] carrying out glory hardening, the very small namely, optical record medium with small thickness unevenness of the thickness distribution of the light transmission layer of the inside-and-outside periphery of a substrate is producible.
[0019]
[Embodiment of the Invention] The gestalt of concrete operation of this invention is explained. Although the case where it applies to the shape of a disk and the so-called disc-like optical disk below is explained, this invention is not restricted to such an optical disk, has a magneto-optic disk, a phase change disk, and other detailed irregularity in an information record layer, and if informational playback or record is performed by carrying out focusing of the light to an information record layer through a light transmission layer, it can apply them about anythings.
[0020] This invention obtains the optical record medium of a configuration of being shown in drawing 1 . That is, the optical record medium shown in drawing 1 imprints detailed irregularity 12 to shaping of a substrate 10 and coincidence, and has after that the configuration which formed the reflective film 14 by aluminum vacuum evaporationo film to the detailed irregularity 12, and formed the information record layer 15, and the thickness of 0.5mm or less formed light transmission layer 18 on the information record layer 15.
[0021] The production approach in this invention of the optical record medium shown in drawing 1 is shown below.
[0022] In this example, the lock out plate 21 which embeds a crevice 20 and is blockaded is inserted in the crevice 20 of a substrate using the substrate 10 with which the crevice is formed in the periphery of 10h of feed holes. By considering as a coalesce substrate and a photo-setting resin being dropped at the core of this coalesce substrate, and making a photo-setting resin extend and carrying out photo-curing by rotating a coalesce substrate, form the light transmission layer 18, pierce a core, 10h of feed holes is made to penetrate, and an optical record medium is obtained.
[0023] First, the substrate 10 with which the crevice is formed in the periphery of a feed hole is produced. Drawing 2 is the outline sectional view of an example of substrate production equipment. In this example, for example with injection molding of light transmission nature resin, such as a polycarbonate, a substrate 10 is fabricated, the detailed irregularity 12 which constitutes the information record layer 15 in shaping of a substrate 10 and coincidence is formed, and the crevice 20 of a substrate is further formed in a substrate 10.
[0024] The substrate production equipment shown in drawing 2 comes to have metal mold equipment 53 which consists of substrate side metal mold 51 which constitutes the cavity 50 for fabricating a substrate 10, and which consists of a stainless steel system metal, for example, and stamper side metal mold 52. The stamper side metal mold 52 is connected with the gate 80 of the light transmission nature resin transmitting mechanism 90 which sends out the light transmission nature resin fused in the cavity 50.
[0025] Light transmission nature resin is sent out to the gate 80 by preparing screw 40s in the light transmission nature resin transmitting mechanism 90, and making it rotate this screw 40s.
[0026] Substrate feed-hole punching pin 51a for finally piercing and forming 10h of feed holes of the shaping substrate 10 in a core is arranged at the substrate side metal mold 51.
[0027] The metal mold 40 with heights which forms the crevice 20 of the substrate 10 which it is arranged with a vacuum-chuck method, and is finally obtained is arranged for the stamper 7 which imprints the detailed irregularity 12 which constitutes the information record layer 15 of a substrate 10 in the stamper side metal mold 52 used in shaping of a substrate 10.

[0028] In the necessary location of the substrate 10 finally obtained, and the example of illustration, it is the periphery of 10h of feed holes of the information signal forming face of a substrate 10, and heights 40a for crevice formation of the shape of a ring of the necessary magnitude for forming a crevice 20 in the coldhearted news record section of the location inside an information record stratification field over the perimeter is prepared in the metal mold 40 with heights.
[0029] And to 40h of feed holes of the metal mold 40 with heights of the core of the metal mold 40 with heights, the gate 80 is open for free passage. Moreover, 7h of feed holes where heights 40a of the metal mold 40 with heights is inserted is drilled in the core of a stamper 7.
[0030] How to fabricate a substrate 10 is explained using this substrate production equipment.
[0031] First, the substrate side metal mold 51 and the stamper side metal mold 52 are made to agree, and a cavity 50 is formed among both. In this condition, light transmission nature resin, for example, a melting polycarbonate, is sent into the gate 80 by rotating screw 40s. Heat will be radiated and light transmission nature resin will be solidified, if it is slushed in a cavity 50 through 40h of feed holes of the metal mold 40 with heights after passing through the gate 80. Next, extrude substrate feed-hole punching pin 51a, it is made to project, 10h of feed holes of a substrate is formed, and a substrate 10 is obtained.
[0032] Thus, as shown in drawing 3 , it is the periphery of 10h of feed holes of a substrate, and the substrate 10 with which heights 40a for crevice formation was imprinted by the coldhearted news record section of the location inside an information record stratification field, and the crevice 20 was formed in it is fabricated.
[0033] If the crevice 20 of this substrate 10 sets the path of the feed hole of a substrate 10 to 15 (mm), as for 30 (mm) and the depth, it is desirable that it is below 0.3 (mm), for example, that periphery can be selected to 0.2 (mm).
[0034] Next, the reflective film 14 by aluminum vacuum evaporationo film is put on the detailed irregularity 12 formed on the substrate 10 at injection molding and coincidence of a substrate 10, and the information record layer 15 is formed in it.
[0035] Next, the lock out plate 21 which embeds in the crevice 20 of a substrate and is blockaded is prepared. As it considers as a circle configuration and is shown in drawing 4 , the lock out plate 21 which considering as a circular crevice is desirable as for the crevice 20 of a substrate 10, embeds this in this case, and is blockaded inserts the lock out plate 21 in the crevice 20 of a substrate 10, and forms the coalesce substrate 25 in it. This lock out plate 21 is produced with the same material as a substrate 10, for example, a polycarbonate. And the path of the lock out plate 21 is selected corresponding to the diameter of inner circumference of the crevice 20 of a substrate 10, and is selected by the magnitude exactly inserted in in a crevice 20. Moreover, it is in the condition inserted in in the crevice 20 of a substrate, and the thickness of this lock out plate 21 is the same as the depth of a crevice 20, or slightly larger than the depth of the crevice 20 of a substrate, therefore when it inserts in a crevice 20, it is selected so that it may project more slightly than a substrate side, so that that front face may form the same flat surface as a substrate side.
[0036] Next, as shown in drawing 5 , the liquefied photo-setting resin 3 is dropped by the nozzle 9 on the core of the lock out plate 21 inserted in the crevice 20 of a substrate 10 in the core of a substrate 10, i.e., this case.
[0037] Next, as shown in drawing 6 , high-speed rotation of the substrate 10 is carried out, and the liquefied photo-setting resin 3 is extended. At this time, the UV irradiation by the light source 22 can perform photo-curing of the liquefied photo-setting resin 3 at the extension and coincidence of the liquefied photo-setting resin 3 by rotation of a substrate 10, and the light transmission layer 18 finally obtained can be produced.
[0038] Thus, by having considered as the configuration which inserted the lock out plate 21 in the crevice 20 of a substrate 10, from the core of a substrate 10, as a photo-setting resin 3 can be dropped now and the measurement result which this explained in above-mentioned drawing 22 was shown, the thickness of the light transmission layer 18 can be formed in homogeneity.
[0039] Next, as shown in drawing 7 , the feed-hole punching machine 71 can be inserted from the core

of a substrate 10, and the light transmission layer 18 and the lock out plate 21 which were made to carry out photo-curing of the lock out plate 21 and the photo-setting resin 3, and formed them are pierced, it can be made to be able to penetrate, 10h of feed holes of a substrate 10 can be formed, and the optical record medium finally made into the purpose can be obtained.

[0040] Moreover, when making the core of a substrate 10 penetrate and forming 10h of feed holes of a substrate 10, as shown in drawing 8 , from the light transmission layer 18 forming-face side of a substrate 10, the feed-hole punching machine 71 is driven in, the light transmission layer 18 and a lock out plate are pierced, it can be made to be able to penetrate and 10h of feed holes of a substrate 10 can also be formed.

[0041] The very small optical record medium of the thickness distribution of the light transmission layer 18 which performs informational read-out or the informational writing from the information record layer 15 is [in / as mentioned above / the production process of the light transmission layer 18] producible by taking the approach of applying a photo-setting resin 3, making carry out rotation extension in the condition of having made 10h of feed holes of a substrate 10 blockading with the lock out plate 21, and carrying out photo-curing.

[0042] Next, other examples which produce the optical record medium of very small namely, uniform thickness of the thickness distribution of a light transmission layer are explained with reference to drawing 9 - drawing 15 .

[0043] The schematic diagram of the manufacturing installation of the optical record medium of this invention is shown in drawing 9 . The manufacturing installation of this optical record medium consists the level pedestal 100 which has the medial axis 101 penetrated to the feed hole of a substrate, and has a rotation function for this medial axis horizontally as a core, the lock out plate 121 which blockades 10h of feed holes of a substrate, and this lock out plate 121 of a lamp L for hardening the electromagnet 102 in which desorption is possible, and a photo-setting resin from a substrate 10.

[0044] This lock out plate 121 has the outer diameter which becomes size, and protrusion supporter 121a inserted in 10h of feed holes is prepared, and it changes from the bore of 10h of feed holes of a substrate to that inferior surface of tongue. As for the lock out plate 121 or protrusion supporter 121a, a part of either [at least] is constituted by the magnetic substance at least. For example, the lock out plate 121 can apply and constitute a magnetic material to the resin plate which constituted with the magnetic metal plate or was produced, for example with injection molding. This lock out plate 121 sets that thickness to 0.1mm or less preferably about 0.3mm or less.

[0045] Moreover, as it is indicated in drawing 15 as this electromagnet 102 and the nozzle 9 which trickles a liquefied photo-setting resin on a substrate 10, it considers as the exchangeable configuration.

[0046] For example, on the revolving-shaft section 131, a nozzle 9 and an electromagnet 102 change a nozzle 9 and an electromagnet 102 as structure which one is made to rotate, and it has them in the core of a substrate 10, and they are made to be caused. On the other hand, it is made as [convey / by the conveyance means 130 / two or more substrates 10].

[0047] Moreover, anything of the configuration of circular and linearity can be used for the configuration of Lamp L. This lamp L is arranged rather than the lock out plate 121 at the periphery side of a substrate 10, and is arranged in the location in which an optical exposure is possible enough also at the outermost periphery of a substrate 10.

[0048] An optical record medium is produced using above-mentioned this invention equipment. First, as shown in drawing 10 , one substrate 10 turns an information record layer up, and is conveyed by the conveyance means 130 above the level pedestal 100. And although it does not illustrate while the level pedestal 100 goes up and the medial axis 101 is inserted all over 10h of feed holes of a substrate 10, adsorption installation of the substrate 10 is carried out on the level pedestal 100 by the vacuum chuck prepared in the level pedestal 100.

[0049] While the lock out plate 121 by which the electromagnet 102 was adsorbed has above the core of the substrate 10 on the level pedestal 100 on the other hand at this time, being caused and inserting that protrusion supporter 121a into 10h of feed holes of a substrate, the lock out plate 121 attaches to the upper limit side of 10h of feed holes of a substrate, and blockades this. And where this lock out is made,

the energization to an electromagnet 102 is severed, after the lock out plate 121 has blockaded 10h of feed holes of a substrate 10, it coalesces, and the coalesce substrate 125 is constituted.
[0050] Next, as shown in drawing 11 , an electromagnet 102 is moved, the nozzle 9 which supplies a photo-setting resin instead is installed above a substrate 10, and a photo-setting resin is dropped at the core of the coalesce substrate 125 from a nozzle 9.
[0051] Then, a nozzle 9 is moved and an electromagnet 102 is instead installed above a substrate 10 again.
[0052] Next, as shown in drawing 12 , extension spreading is uniformly carried out by rotating [the photo-setting resin dropped on this coalesce substrate 125] the rotation pedestal 100 for the coalesce substrate 125.
[0053] Then, as shown in drawing 13 , the lock out plate 121 is adsorbed with an electromagnet 102 during rotation of the coalesce substrate 125, and it removes from the coalesce substrate 125.
[0054] Next, as shown in drawing 14 , photo-curing of the photo-setting resin is carried out with Lamp L, and the light transmission layer which constitutes the optical record medium finally obtained is formed.
[0055] The process mentioned above can be continuously performed repeatedly by having a substrate 10 on the level pedestal 100 one by one, and causing it with the conveyance means 130, as drawing 15 explained. And according to the above-mentioned configuration, the migration shift of the nozzle 9 which carries out supply dropping of the photo-setting resin, and the electromagnet 102 which performs adsorption of the lock out plate 121 and desorption can be quickly carried out on the core of a substrate 10 by having considered as the structure rotated to one.
[0056] In an above-mentioned example, although what applied magnetic powder to the metal plate with a thickness of about 0.3mm and the resin plate produced by carrying out injection molding of the photo-setting resin can be used for the lock out plate 121 shown in drawing 9 , since it is necessary to use this lock out plate 121 repeatedly, the reinforcement which can be equal to repeat use is required. For this reason, it is necessary to make this lock out plate 121 to some extent thick.
[0057] Then, since it can avoid that the lock out plate 121 projects too much from a substrate also when a substrate 10 and the lock out plate 121 are made to agree and a coalesce substrate is formed, as shown in drawing 17 if crevice 10a is beforehand formed on the outskirts of a core of a substrate 10 as shown in drawing 16 , the to some extent thick lock out plate 121 can be used. However, it is desirable in the depth of crevice 10a of this substrate being selected in this case more shallowly than the thickness of the lock out plate 121. For example, if thickness of a substrate 10 is set to 1.2mm and the depth of substrate crevice 10a is set to 0.3mm, thickness of the lock out plate 121 can be set to about 0.4mm.
[0058] Moreover, in the example mentioned above, as shown in drawing 18 , by attaching an O ring or packing in the contact section of the lock out plate 121 and a substrate 10, it can prevent that a photo-setting resin invades between a substrate 10 and the lock out plate 121, and, thereby, the spreading unevenness of a photo-setting resin and the poor appearance of an optical record medium which are finally acquired can be avoided.
[0059] Moreover, if it is the condition of carrying out line contact with the side-attachment-wall section of 10h of feed holes of a substrate when the side face of the lock out plate 121 is made into the shape of a taper and 10h of feed holes of a substrate 10 is embedded, as shown in drawing 19 , since a clearance will not be made between a substrate 10 and the lock out plate 121, invasion of a photo-setting resin is avoidable.
[0060] In an above-mentioned example, although the reflective film 14 of the information record layer 15 which constitutes the optical record medium of this invention was formed with aluminum vacuum evaporationo film, this invention is not limited to this example and it can also apply metals, such as Au.
[0061] Moreover, although the case where the optical record medium of monolayer structure was produced was explained in the example mentioned above This invention by adding the process which makes the stamper for a detailed irregularity imprint which constitutes an information record layer agree, after applying a photo-setting resin 3 on the above-mentioned substrate 10, and making a light transmission layer form like the example further mentioned above after that It can apply, when

producing the optical record medium of two-layer structure or the multilayer structure which has an information record layer more than it.

[0062]

[Effect of the Invention] According to this invention, since the light transmission layer which performs read-out of the recording information from the information record layer of an optical record medium or informational writing was made to form through the process which trickles into the core of a substrate and carries out rotation extension when forming by carrying out photo-curing of the liquefied photo-setting resin, light transmission **** could be thinly formed in uniform thickness, and high recording density-ization of an optical record medium was able to be attained.

[0063] Moreover, while making the liquefied photo-setting resin extend by rotation of a substrate, it was effectively avoidable by stiffening a photo-setting resin by optical exposure that distribution arises in the thickness of the light transmission layer from which a photo-setting resin is finally obtained with the surface tension.

[0064] Moreover, it was avoidable to produce a defect in an information record layer by forming inside the most inner circumference of the detailed irregularity which constitutes the information record layer formed on the substrate in the periphery of the crevice of a substrate.

[0065] The thickness of the lock out plate for embedding the crevice of a substrate moreover, by making it form more thickly than the depth of the crevice of a substrate, and the depth of abbreviation identitas or a crevice In the condition of having embedded the lock out plate at the substrate, when applying a liquefied photo-setting resin and extending by this that it will be in the condition that the core of a substrate became depressed by the ability avoiding, the substrate core was covered with the liquefied photo-setting resin, and it was able to avoid that it will be in the condition that extension is barred.

[0066] Moreover, the thickness of the lock out plate 21 which embeds the crevice of a substrate can be set up thinly, and it was able to make it possible to pierce the feed hole of a substrate easily by this by selecting the depth of the crevice of a substrate below to 0.3 (mm).

[0067] Moreover, the production process of an optical record medium can be performed now more simply and quickly by inserting in the feed hole of a substrate and performing desorption of a lock out plate during rotation of a coalesce substrate using the ingredient which has magnetism as a lock out plate which blockades this.

[0068] Moreover, according to the manufacturing installation of the optical record medium of this invention, the light transmission layer which constitutes an optical record medium was able to be formed in thin and uniform thickness simply and quickly.

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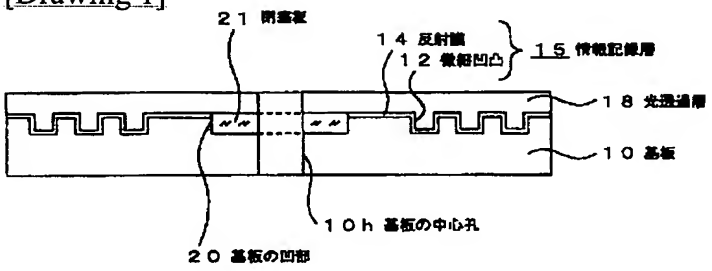
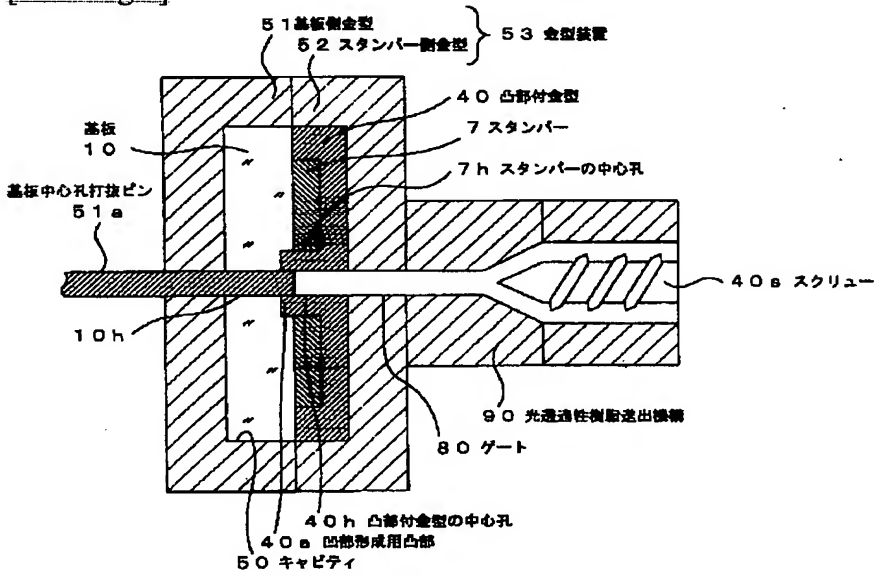
DRAWINGS

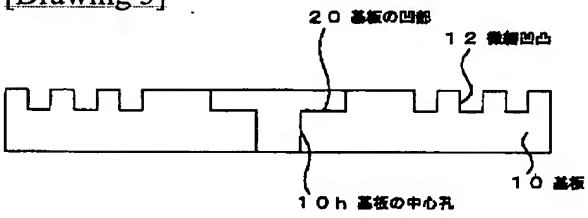
[Drawing 1]



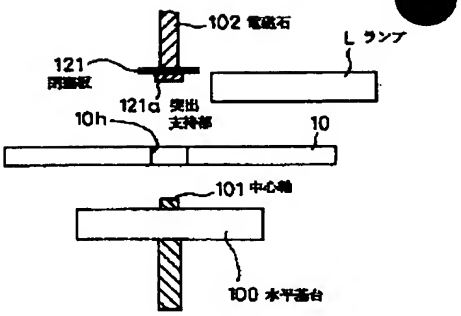
[Drawing 2]



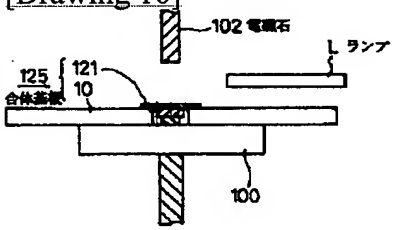
[Drawing 3]



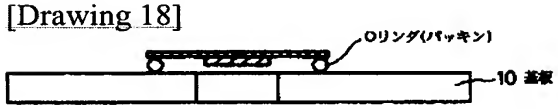
[Drawing 9]



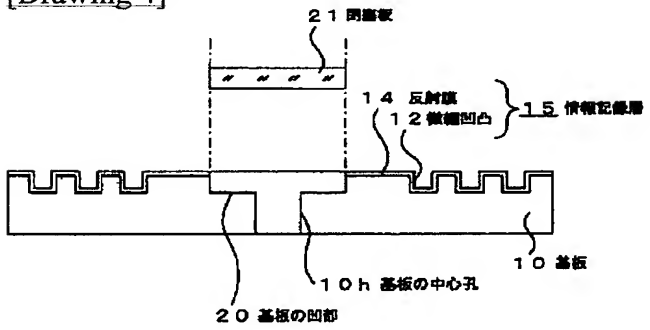
[Drawing 10]



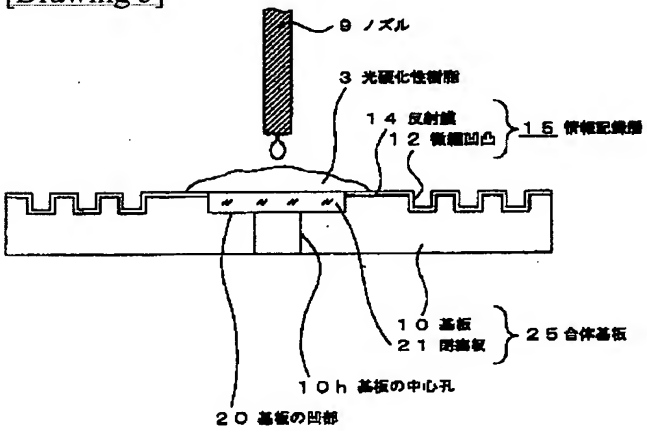
[Drawing 18]



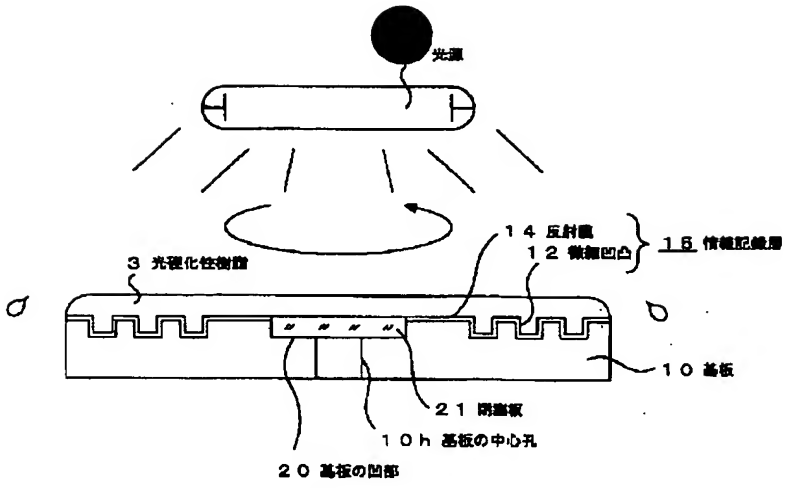
[Drawing 4]



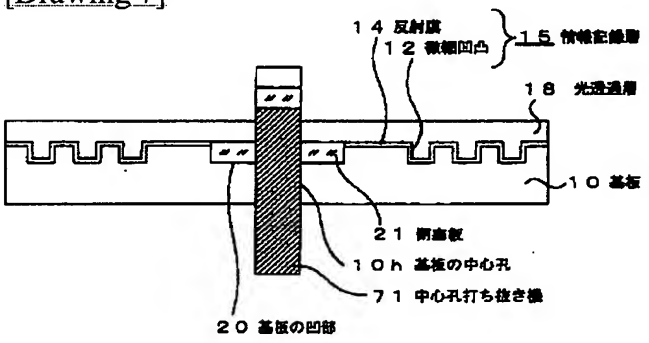
[Drawing 5]



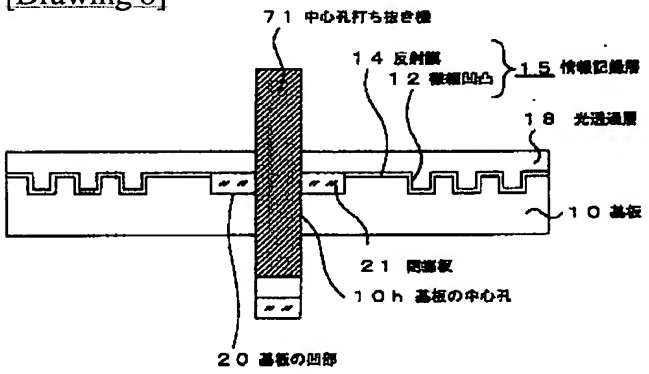
[Drawing 6]



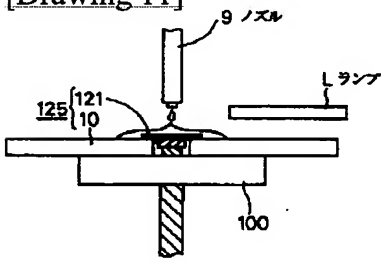
[Drawing 7]



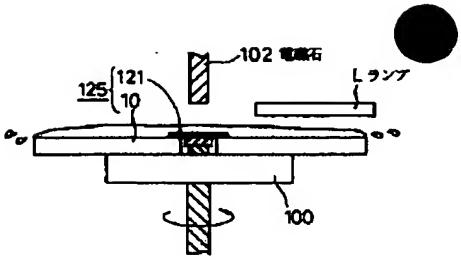
[Drawing 8]



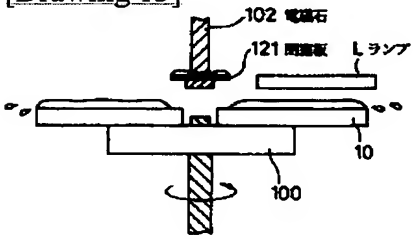
[Drawing 11]



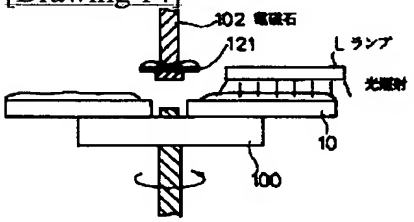
[Drawing 12]



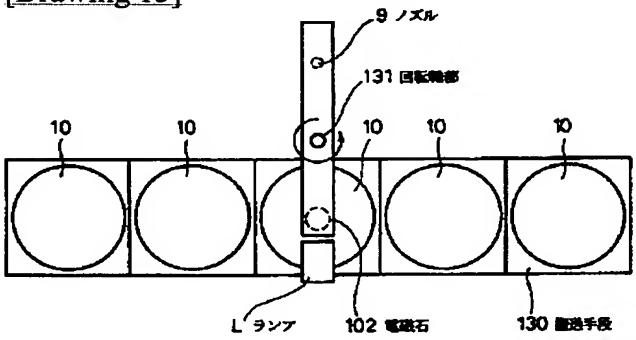
[Drawing 13]



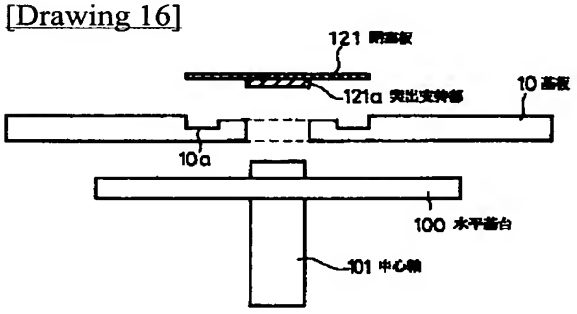
[Drawing 14]



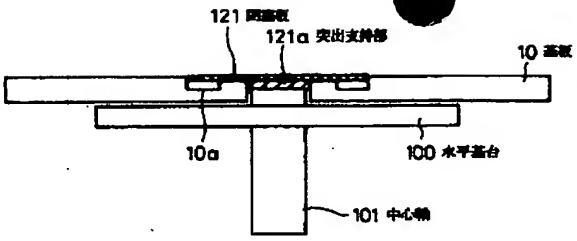
[Drawing 15]



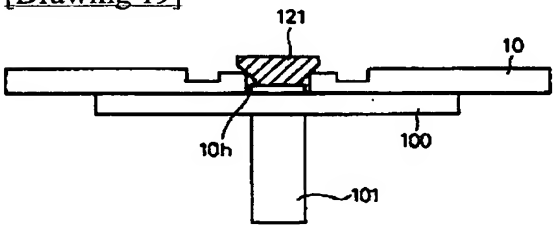
[Drawing 16]



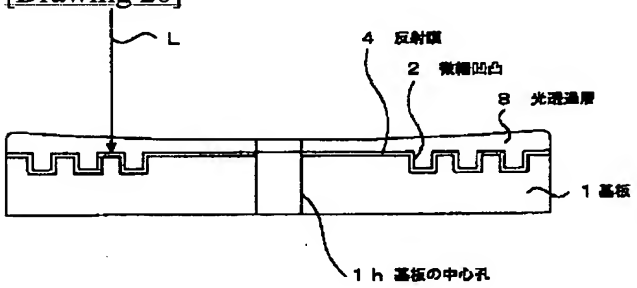
[Drawing 17]



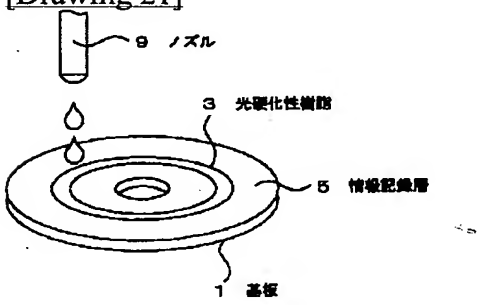
[Drawing 19]



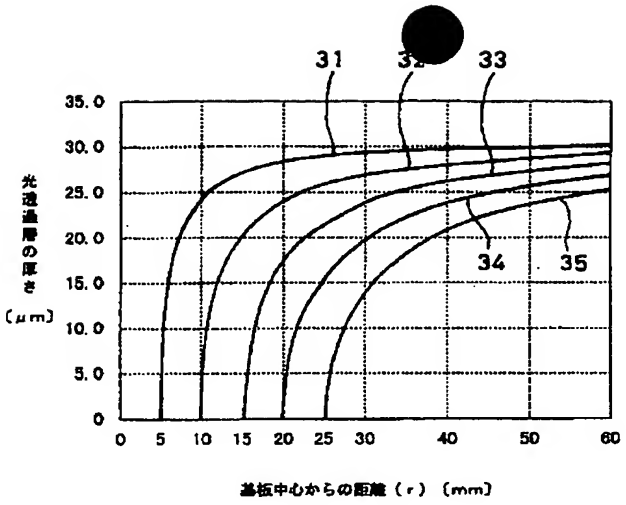
[Drawing 20]



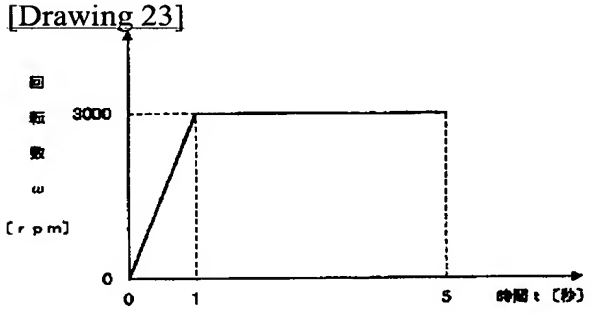
[Drawing 21]



[Drawing 22]



[Drawing 23]



[Translation done.]

* NOTICES *

CORRECTION OR AMENDMENT

[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law
[Section partition] The 4th partition of the 6th section
[Publication date] November 25, Heisei 16 (2004. 11.25)

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[Date of Publication] October 27, Heisei 10 (1998. 10.27)
[Application number] Japanese Patent Application No. 9-129836
[The 7th edition of International Patent Classification]

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// G11B 5/842

[FI]

G11B 7/26 521
G11B 5/842 Z

[Procedure revision]
[Filing Date] December 10, Heisei 15 (2003. 12.10)
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[The contents of amendment]
[Claim(s)]
[Claim 1]
The substrate with which the crevice is formed in the periphery of a feed hole is used,
The process which inserts in the above-mentioned crevice the lock out plate which embeds this crevice, and is used as a coalesce substrate,
The process which forms a light transmission layer by dropping a photo-setting resin at the core of this coalesce substrate, making this photo-setting resin extend by rotating the above-mentioned coalesce substrate, and carrying out photo-curing,
The manufacture approach of the optical record medium characterized by piercing a core and having the process which makes a feed hole penetrate.
[Claim 2]
The manufacture approach of the optical record medium according to claim 1 characterized by carrying out photo-curing of the photo-setting resin dropped at the core of the above-mentioned coalesce substrate to coincidence in the process which carries out rotation extension.
[Claim 3]

The manufacture approach of [redacted] optical record medium according to claim [redacted] characterized by being inside the most inner circumference of the detailed irregularity from which the periphery of the crevice of the transparence substrate currently formed in the periphery of the above-mentioned feed hole constitutes the information record layer formed on the above-mentioned transparence substrate.
[Claim 4]
The manufacture approach of an optical record medium according to claim 1 that the depth of the crevice of the transparence substrate currently formed in the periphery of the above-mentioned feed hole is characterized by being 0.3mm or less.
[Claim 5]
The process which inserts in the lock out plate which blockades the feed hole of this substrate using the substrate which has a feed hole, and is used as a coalesce substrate,
The process made to extend by dropping a photo-setting resin at the core of this coalesce substrate by rotating the above-mentioned coalesce substrate for this photo-setting resin,
The process which removes the above-mentioned lock out plate,
The manufacture approach of the optical record medium characterized by having the process which forms a light transmission layer by carrying out photo-curing of the above-mentioned photo-setting resin.
[Claim 6]
The process which inserts in the lock out plate which blockades the feed hole of this substrate using the substrate which has a feed hole, and is used as a coalesce substrate,
The process made to extend by dropping a photo-setting resin at the core of this coalesce substrate by rotating the above-mentioned coalesce substrate for this photo-setting resin,
The process which removes the above-mentioned lock out plate during rotation of the above-mentioned coalesce substrate,
The manufacture approach of the optical record medium characterized by having the process which forms a light transmission layer by carrying out photo-curing of the above-mentioned photo-setting resin.
[Claim 7]
In the process which removes the above-mentioned lock out plate,
The manufacture approach of the optical record medium according to claim 5 or 6 characterized by adsorbing the above-mentioned lock out plate with a magnet.
[Claim 8]
The manufacture approach of the optical record medium according to claim 5 or 6 characterized by carrying out photo-curing of the above-mentioned photo-setting resin, and forming a light transmission layer during rotation of a coalesce substrate after the process which removes the above-mentioned lock out plate.
[Claim 9]
The level pedestal which has the function to rotate a substrate horizontally,
The lock out plate which blockades the feed hole of a substrate,
The electromagnet which has the function which carries out desorption of this lock out plate from a substrate,
It consists of a lamp,
The manufacturing installation of the optical record medium characterized by considering the above-mentioned electromagnet and the nozzle which trickles a liquefied photo-setting resin on a substrate as the exchangeable configuration.
[Claim 10]
The manufacturing installation of the optical record medium according to claim 9 characterized by the above-mentioned lock out plate being a magnetic material.
[Procedure amendment 2]
[Document to be Amended] Specification
[Item(s) to be Amended] 0002

[Method of Amendment] Modification
[The contents of amendment]
[0002]
[Description of the Prior Art]
Although there are optical record media, such as ROM (Read Only Memory) molds, such as an optical disk which performs the record or playback by optical exposure, an optical card, a magneto-optic disk, and a phase change optical record medium, a postscript mold, and a rewriting mold, as an optical record medium which records the various information on the object for audios, and the object for videos and others, the phase pit where the data information of the information record layer and record are made in a ROM mold [as / in a compact disk], and detailed irregularity are formed by injection molding, for example.
[Procedure amendment 3]
[Document to be Amended] Specification
[Item(s) to be Amended] 0003
[Method of Amendment] Modification
[The contents of amendment]
[0003]
With increase-izing of the amount of recording information, high recording density-ization needed to be attained and numerical-aperture N.A. of the objective lens of an optical pickup needed to be enlarged as much as possible by this. Thus, since the inclination tolerance of an optical record medium decreases when enlarging numerical-aperture N.A. of an objective lens, the optical exposure to an information record layer will be made from the light transmission layer side formed on this, and, moreover, it will be necessary to set thickness of this light transmission layer to 0.5mm or less enough at smallness.
[Procedure amendment 4]
[Document to be Amended] Specification
[Item(s) to be Amended] 0019
[Method of Amendment] Modification
[The contents of amendment]
[0019]
[Embodiment of the Invention]
The gestalt of concrete operation of this invention is explained.
Although the case where it applies to the optical disk which named generically the shape of a disk, the so-called disc-like magneto-optic disk, the phase change disk, the ROM disk, etc. below is explained, this invention is not restricted to such an optical disk, has detailed irregularity in an information record layer, and if informational playback or record is performed by carrying out focusing of the light to an information record layer through a light transmission layer, it can apply it about anythings.

[Translation done.]

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// Ｇ１１Ｂ　5/842			5/842	Ｚ

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(54)【発明の名称】　光学記録媒体の製造方法および製造装置

(57)【要約】

【課題】　情報の読み込み、あるいは書き込みを行う光透過層を均一な厚さに形成する。

【解決手段】　基板の中心孔を閉塞板で閉塞して合体基板とし、この合体基板の中心部に光硬化性樹脂を滴下して、回転延伸させ、光硬化することにより、光透過層を形成する。

【特許請求の範囲】
【請求項１】　中心孔の周辺部に凹部が形成されている基板を用いて、
上記凹部に、該凹部を埋め込む閉塞板を嵌め込んで、合体基板とする工程と、
該合体基板の中心部に光硬化性樹脂を滴下して該光硬化性樹脂を、上記合体基板を回転することによって、延伸させ、光硬化することにより、光透過層を形成する工程と、
中心部を打ち抜いて、中心孔を貫通させる工程とを有することを特徴とする光学記録媒体の製造方法。
【請求項２】　上記合体基板の中心部に滴下した光硬化性樹脂を回転延伸する工程において、同時に光硬化することを特徴とする請求項１に記載の光学記録媒体の製造方法。
【請求項３】　上記中心孔の周辺部に形成されている透明基板の凹部の外周が、上記透明基板上に形成された情報記録層を構成する微細凹凸の最内周よりも、内側にあることを特徴とする請求項１に記載の光学記録媒体の製造方法。
【請求項４】　上記中心孔の周辺部に形成されている透明基板の凹部の深さが、０．３mm以下であることを特徴とする請求項１に記載の光学記録媒体の製造方法。
【請求項５】　中心孔を有する基板を用いて、該基板の中心孔を閉塞する閉塞板を嵌め込んで、合体基板とする工程と、
該合体基板の中心部に光硬化性樹脂を滴下して該光硬化性樹脂を、上記合体基板を回転することによって、延伸させる工程と、
合体基板の回転中に上記閉塞板を取り外す工程と、
上記光硬化性樹脂を光硬化することにより、光透過層を形成する工程とを有することを特徴とする光学記録媒体の製造方法。
【請求項６】　上記閉塞板を取り外す工程において、
磁石により上記閉塞板を吸着することを特徴とする請求項５に記載の光学記録媒体の製造方法。
【請求項７】　上記閉塞板を取り外す工程の後、合体基板の回転中に、上記光硬化性樹脂を光硬化して光透過層を形成することを特徴とする請求項５に記載の光学記録媒体の製造方法。
【請求項８】　基板を水平方向に回転する機能を有する水平基台と、基板の中心孔を閉塞する閉塞板と、該閉塞板を基板から脱着する機能を有する電磁石と、ランプからなり、上記電磁石と、基板上に液状光硬化性樹脂を滴下するノズルとが、交換可能な構成とされていることを特徴とする光学記録媒体の製造装置。
【請求項９】　上記閉塞板が磁性材料であることを特徴とする請求項８に記載の光学記録媒体の製造装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、光学記録媒体の製造方法および製造装置に係わる。
【０００２】
【従来の技術】オーディオ用、ビデオ用その他の各種情報を記録する光学記録媒体として、その記録もしくは再生を光照射によって行う光ディスク、光カード、光磁気ディスク、相変化光学記録媒体等のＲＯＭ（Ｒｅａｄ　Ｏｎｌｙ　Ｍｅｍｏｒｙ）型、追記型、書換え型等の光学記録媒体があるが、例えば、コンパクトディスクにおけるようなＲＯＭ型においてその情報記録層のデータ情報、トラッキングサーボ信号等の記録がなされる位相ピット、プリグルーブ等の微細凹凸は、射出成形によって形成される。
【０００３】記録情報量の増大化に伴い、高記録密度化を図る必要があり、これによって、光ピックアップの対物レンズの開口数Ｎ．Ａ．をできるだけ大きくする必要が生じた。このように、対物レンズの開口数Ｎ．Ａ．を大きくする場合、対物レンズと情報記録層との間隔は小さく選定される必要があり、また、この場合、光学記録媒体の傾き許容度が減少することから、情報記録層に対する光照射は、これの上に形成された光透過層側からなされ、しかも、この光透過層の厚さは充分小に、例えば０．５mm以下とする必要が生じている。
【０００４】図２０に、従来製法により作製した、情報記録層上に形成された光透過層側から記録情報の読み出し、あるいは書き込みを行う構成の光学記録媒体の概略断面図を示す。
【０００５】図２０に示す光学記録媒体は、基板１を射出成形によって形成すると同時に微細凹凸２の転写がなされ、その後、微細凹凸２に例えばＡｌ蒸着膜による反射膜４を成膜し、情報記録層５を形成し、その情報記録層５上に、０．５mm以下の厚さの光透過層８形成した構成を有する。
【０００６】図２０に示す光学記録媒体の作製方法を以下に示す。
【０００７】先ず、射出成形による基板１の成形と同時に微細凹凸２の転写を行い、次に、図２１に示すように、基板１の情報記録層５形成面側に、ノズル９から液体光硬化性樹脂３を例えば円形に塗布し、その後、基板１を回転させることにより延伸し、これを光硬化することにより、図２０に示した光透過層８を形成する。
【０００８】この図２０に示す光学記録媒体に対する情報記録層５からの情報の読み出しは、光透過層８側から、読み出し光Ｌの光照射によって行う。
【０００９】
【発明が解決しようとする課題】しかしながら、上述したように、液体光硬化性樹脂３を基板１上に例えば円形に回転塗布して光硬化させることにより、光透過層８を形成すると、遠心力により液体光硬化性樹脂３が基板１上の最外周部に偏り、これにより、図２０に示すよう

に、光透過層８が、基板１上の最外周部が内周部よりも厚く形成され、光透過層８の厚さに不均一が生じる。

【００１０】このように光透過層８の厚さが不均一になると、光学記録媒体の光ピックアップによる信号の記録再生の際に、集光スポットの収差を生じる原因となり、記録再生信号の劣化を生じる。

【００１１】ここで、基板上に液体光硬化性樹脂を塗布する場合に、光硬化性樹脂の塗布開始位置の基板中心からの距離（r_0）と、光透過層の厚さの分布との関係を図２２に示す。図２２に示した光硬化性樹脂の塗布開始位置の基板中心からの距離（r_0）と、光透過層の厚さの分布との関係を測定する場合には、光硬化性樹脂の塗布開始位置の基板中心からの距離（r_0）は５～２５（ｍｍ）の範囲で５（ｍｍ）間隔で移動させた場合の分布を示す。光硬化性樹脂はＳＤ－３０１（大日本インキ社製）を使用した。また、光硬化性樹脂を回転延伸させる際の基板の回転パターンを図２３に示す。

【００１２】ここで、図２２において、曲線３１は、光硬化性樹脂の塗布開始位置の基板中心からの距離（r_0）が５（ｍｍ）のときの光透過層の厚さ（μｍ）の分布を表し、曲線３２はr_0＝１０（ｍｍ）、曲線３３はr_0＝１５（ｍｍ）、曲線３４はr_0＝２０（ｍｍ）、曲線３５はr_0＝２５（ｍｍ）のときのそれぞれの光透過層の厚さの分布を表す。

【００１３】図２２によれば、光硬化性樹脂の塗布開始位置（r_0）が基板の内周側に行くほど、内外周の光透過層厚差の小さい分布が得られることがわかる。例えば塗布開始位置が２０（ｍｍ）のときの光透過層の内外周における厚さの差は７μｍ以上であるのに対し、塗布開始位置が５（ｍｍ）のときの光透過層の内外周における厚さの差は１μｍ以下となる。このように光硬化性樹脂の塗布開始位置をさらに基板の内周側に持っていき、基板の中心部から光硬化性樹脂を塗布することとすると、理論上は、膜厚差のない完全に平面の光透過層が得られることになる。

【００１４】しかし、光学記録媒体の、特に光ディスクの場合には、ディスクの中心孔や、基板の射出成形の際に生じた微細凹凸転写用のスタンパーによる押圧溝があるため、光硬化性樹脂の塗布開始位置を基板の中心部とすることができず、スタンパーの押圧溝の外側が光硬化性樹脂の塗布開始位置の限界であった。このため、光透過層の厚さにむらが生じることとなっていた。

【００１５】そこで、本発明においては、光透過層を形成する際の、基板上の光硬化性樹脂の塗布開始位置を基板の中心部とすることができるようにして光透過層の厚さにむらが生じることを効果的に回避した光学記録媒体を作製する。

【００１６】

【課題を解決するための手段】本発明は、中心孔の周辺部に凹部が形成されている基板を用いて、基板の凹部に、凹部を埋め込んで閉塞する閉塞板を嵌め込んで、合体基板とし、この合体基板の中心部に光硬化性樹脂を滴下して、光硬化性樹脂を、合体基板を回転することによって、延伸させ、光硬化することにより、光透過層を形成し、中心部を打ち抜いて、中心孔を貫通させて、光学記録媒体を作製する。

【００１７】また、本発明は、基板の中心孔に閉塞板を嵌め込んで、合体基板とし、この合体基板の中心部に光硬化性樹脂を滴下して回転延伸させ、合体基板の回転中に閉塞板を取り外し、光硬化性樹脂を光硬化することにより、光透過層を形成して光学記録媒体を作製する。

【００１８】本発明によれば、基板の中心部に光硬化性樹脂を滴下して、回転塗布し、その後光硬化することにより光透過層を形成するため、基板の内外周の光透過層の厚さ分布の極めて小さいすなわち、厚さむらが小さい光学記録媒体を作製することができる。

【００１９】

【発明の実施の形態】本発明の具体的な実施の形態について説明する。以下において、ディスク状、いわゆる円板状の光ディスクに適用する場合について説明するが、本発明はこのような光ディスクに限られるものではなく、光磁気ディスク、相変化ディスク、その他微細凹凸を情報記録層に有し、情報記録層に、光透過層を介して光をフォーカシングされることにより、情報の再生、あるいは記録を行うものであれば、いかなるものについても適用することができる。

【００２０】本発明は、例えば図１に示す構成の光学記録媒体を得るものである。すなわち、図１に示す光学記録媒体は、基板１０の成形と同時に微細凹凸１２の転写を行い、その後、微細凹凸１２に例えばＡｌ蒸着膜による反射膜１４を成膜して情報記録層１５を形成し、その情報記録層１５上に、０．５ｍｍ以下の厚さの光透過層１８形成した構成を有する。

【００２１】図１に示す光学記録媒体の本発明における作製方法を以下に示す。

【００２２】この例においては、中心孔１０ｈの周辺部に凹部が形成されている基板１０を用いて、基板の凹部２０に、凹部２０を埋め込み閉塞する閉塞板２１を嵌め込んで、合体基板とし、この合体基板の中心部に光硬化性樹脂を滴下して、光硬化性樹脂を、合体基板を回転することによって、延伸させ、光硬化することにより、光透過層１８を形成し、中心部を打ち抜いて、中心孔１０ｈを貫通させて、光学記録媒体を得る。

【００２３】先ず、中心孔の周辺部に凹部が形成されている基板１０を作製する。図２は、基板作製装置の一例の概略断面図である。この例においては、例えばポリカーボネート等の光透過性樹脂の射出成形によって、基板１０の成形を行い、基板１０の成形と同時に、情報記録層１５を構成する微細凹凸１２を形成し、さらに基板１０に、基板の凹部２０を形成する。

【００２４】図２に示す基板作製装置は、基板１０を成形するためのキャビティ５０を構成する例えばステンレス系金属よりなる基板側金型５１とスタンパー側金型５２からなる金型装置５３を有してなる。スタンパー側金型５２は、キャビティ５０内に溶融した光透過性樹脂を送り出す光透過性樹脂送出機構９０のゲート８０に連結されている。

【００２５】光透過性樹脂送出機構９０には、スクリュー４０ｓが設けられ、このスクリュー４０ｓを回転させることにより、光透過性樹脂はゲート８０に送り出される。

【００２６】基板側金型５１には、中心部に最終的に成形基板１０の中心孔１０ｈを打ち抜いて形成するための基板中心孔打抜ピン５１ａが配置されている。

【００２７】基板１０の成形において使用するスタンパー側金型５２には、基板１０の情報記録層１５を構成する微細凹凸１２を転写するスタンパー７が例えば真空チャック方式により配置され、また、最終的に得る基板１０の凹部２０を形成する凸部付金型４０とが配置される。

【００２８】凸部付金型４０には、最終的に得る基板１０の所要の位置、図示の例では基板１０の情報信号形成面の中心孔１０ｈの周辺部であって、情報記録層形成領域よりも内側の位置の非情報記録領域に、全周に渡って凹部２０を形成するための所要の大きさのリング状の凹部形成用凸部４０ａが設けられている。

【００２９】そして凸部付金型４０の中心部の凸部付金型４０の中心孔４０ｈに、ゲート８０が連通する。また、スタンパー７の中心部には、凸部付金型４０の凸部４０ａが挿入される中心孔７ｈが穿設されている。

【００３０】この基板作製装置を用いて、基板１０を成形する方法について説明する。

【００３１】先ず、基板側金型５１とスタンパー側金型５２とを合致させて、両者間にキャビティ５０を形成する。この状態で、光透過性樹脂、例えば溶融ポリカーボネートを、スクリュー４０ｓを回転させることによりゲート８０に送り込む。光透過性樹脂はゲート８０を通過した後、凸部付金型４０の中心孔４０ｈを通じて、キャビティ５０内に流し込まれると、放熱され固化する。次に、基板中心孔打抜ピン５１ａを押し出し突出させ、基板の中心孔１０ｈを形成し、基板１０が得られる。

【００３２】このようにして、図３に示すように、基板の中心孔１０ｈの周辺部であって、情報記録層形成領域よりも内側の位置の非情報記録領域に、凹部形成用凸部４０ａが転写されて凹部２０が形成された基板１０が成形される。

【００３３】この基板１０の凹部２０は、基板１０の中心孔の径を１５（ｍｍ）とすると、その外周を例えば３０（ｍｍ）、深さは、０．３（ｍｍ）以下であることが望ましく、例えば０．２（ｍｍ）に選定することができる。

【００３４】次に、基板１０上に、基板１０の射出成形と同時に形成した微細凹凸１２に、例えばＡｌ蒸着膜による反射膜１４を被着して情報記録層１５を形成する。

【００３５】次に、基板の凹部２０に埋め込み閉塞する閉塞板２１を用意する。基板１０の凹部２０は円形凹部とすることが好ましく、この場合、これを埋め込み閉塞する閉塞板２１は円形状とされ、そして、図４に示すように、基板１０の凹部２０に、閉塞板２１を嵌め込んで、合体基板２５を形成する。この閉塞板２１は、基板１０と同じ素材、例えばポリカーボネートにより作製する。そして、閉塞板２１の径は、基板１０の凹部２０の内周径に対応して選定され、凹部２０内にちょうど嵌め込まれる大きさに選定される。また、この閉塞板２１の厚さは、基板の凹部２０内に嵌め込まれた状態で、その表面が基板面と同一平面を形成するように、凹部２０の深さと同じか、あるいは基板の凹部２０の深さよりも、わずかに大きく、従って、凹部２０に嵌め込んだとき、基板面よりわずかに突出するように選定する。

【００３６】次に、図５に示すように、基板１０の中心部、すなわちこの場合、基板１０の凹部２０に嵌め込まれた閉塞板２１の中心上に、ノズル９により、液状の光硬化性樹脂３を滴下する。

【００３７】次に、図６に示すように、基板１０を高速回転し、液状光硬化性樹脂３を延伸する。このとき、基板１０の回転による液状光硬化性樹脂３の延伸と同時に、光源２２による紫外線照射により、液状光硬化性樹脂３の光硬化を行い、最終的に得られる光透過層１８を作製することができる。

【００３８】このように、基板１０の凹部２０に閉塞板２１を嵌め込んだ構成としたことにより、基板１０の中心部から、光硬化性樹脂３を滴下することができるようになり、これにより、上記の図２２において説明した測定結果において示したように、光透過層１８の厚さを均一に形成することができる。

【００３９】次に、図７に示すように、中心孔打ち抜き機７１を、基板１０の中心部から挿入して、閉塞板２１および光硬化性樹脂３を光硬化させて形成した光透過層１８および閉塞板２１を打ち抜き、貫通させて、基板１０の中心孔１０ｈを形成して、最終的に目的とする光学記録媒体を得ることができる。

【００４０】また、基板１０の中心孔１０ｈを基板１０の中心部を貫通させて形成する場合には、図８に示すように、基板１０の光透過層１８形成面側から、中心孔打ち抜き機７１を打ち込み、光透過層１８および閉塞板を打ち抜き、貫通させて、基板１０の中心孔１０ｈを形成することもできる。

【００４１】上述のようにして、光透過層１８の作製工程において、基板１０の中心孔１０ｈを閉塞板２１により閉塞させた状態で光硬化性樹脂３を塗布し、回転延伸

させ、光硬化する方法を採ることにより、情報記録層１５からの情報の読み出しあるいは書き込みを行う光透過層１８の厚さ分布の極めて小さい光学記録媒体を作製することができる。

【００４２】次に、光透過層の厚さ分布の極めて小さい、すなわち均一な厚さの光学記録媒体を作製する他の実施例について、図９～図１５を参照して説明する。

【００４３】図９に本発明の光学記録媒体の製造装置の概略図を示す。この光学記録媒体の製造装置は、基板の中心孔に貫通する中心軸１０１を有し、この中心軸を中心として水平方向に回転機能を有する水平基台１００と、基板の中心孔１０ｈを閉塞する閉塞板１２１と、この閉塞板１２１を基板１０から脱着可能な電磁石１０２と、光硬化性樹脂を硬化するためのランプＬからなる。

【００４４】この閉塞板１２１は、基板の中心孔１０ｈの内径より大なる外径を有し、その下面に中心孔１０ｈに挿入される突出支持部１２１ａが設けられて成る。閉塞板１２１または突出支持部１２１ａは、少なくともいずれか一方の少なくとも一部が磁性体によって構成される。例えば閉塞板１２１は磁性金属板によって構成するとか、例えば射出成形で作製した樹脂板に磁性材料を塗布して構成することができる。この閉塞板１２１は、その厚さを０．３mm程度以下、好ましくは０．１mm以下とする。

【００４５】また、この電磁石１０２と、基板１０上に液状光硬化性樹脂を滴下するノズル９とは、図１５に示すように、交換可能な構成とされている。

【００４６】例えば、ノズル９と電磁石１０２とは、回転軸部１３１上に一体に回転させる構造として、ノズル９と電磁石１０２とが、交代して基板１０の中心部に持ち来されるようにする。一方、複数の基板１０が搬送手段１３０によって搬送されるようになされる。

【００４７】また、ランプＬの形状は、円形、線形のいずれの形状のものも使用することができる。このランプＬは、閉塞板１２１よりも基板１０の外周側に配置されており、基板１０の最外周部にも充分光照射が可能な位置に配置されている。

【００４８】上述の本発明装置を用いて光学記録媒体を作製する。先ず、図１０に示すように、１つの基板１０が情報記録層を上にして水平基台１００の上方に搬送手段１３０によって搬送されて来る。そして、水平基台１００が上昇し、その中心軸１０１が基板１０の中心孔１０ｈ中に挿入されると共に、図示しないが、水平基台１００に設けられている真空チャックにより基板１０が水平基台１００上に吸着載置される。

【００４９】一方、このとき、電磁石１０２に吸着された閉塞板１２１が水平基台１００上の基板１０の中心部の上方に持ち来されていて、その突出支持部１２１ａが基板の中心孔１０ｈ内に挿入されると共に、閉塞板１２１が、基板の中心孔１０ｈの上端面に衝合してこれを閉塞する。そして、この閉塞がなされた状態で電磁石１０２への通電が断たれ、閉塞板１２１が基板１０の中心孔１０ｈを閉塞した状態で合体し、合体基板１２５が構成される。

【００５０】次に、図１１に示すように、電磁石１０２を移動させ、代わりに光硬化性樹脂を供給するノズル９を基板１０の上方に設置して、合体基板１２５の中心部にノズル９から光硬化性樹脂を滴下する。

【００５１】その後、ノズル９を移動させて代わりに再び電磁石１０２を基板１０の上方に設置する。

【００５２】次に、図１２に示すように、この合体基板１２５上に滴下した光硬化性樹脂を、合体基板１２５を回転基台１００を回転することによって、一様に延伸塗布する。

【００５３】その後、図１３に示すように、合体基板１２５の回転中に閉塞板１２１を電磁石１０２によって吸着して、合体基板１２５から取り外す。

【００５４】次に、図１４に示すように、光硬化性樹脂をランプＬにより光硬化して、最終的に得られる光学記録媒体を構成する光透過層を形成する。

【００５５】上述した工程は、図１５で説明したように基板１０を搬送手段１３０によって順次水平基台１００上に持ち来すことによって連続して繰り返し行うことができる。そして、上述の構成によれば、光硬化性樹脂を供給滴下するノズル９と、閉塞板１２１の吸着および脱着を行う電磁石１０２とは、一体に回転する構造としたことにより迅速に基板１０の中心部上に移動交代することができる。

【００５６】上述の実施例において、図９に示した閉塞板１２１は、例えば厚さ０．３mm程度の金属板や、光硬化性樹脂を射出成形することにより作製した樹脂板に磁性粉を塗布したものを用いることができるが、この閉塞板１２１は繰り返し使用する必要があるため、繰り返し使用に耐えられる強度が要求される。このため、この閉塞板１２１をある程度厚くすることが必要になる。

【００５７】そこで、図１６に示すように、基板１０の中心部周辺に予め凹部１０ａを形成しておくと、図１７に示すように、基板１０と閉塞板１２１を合致させて合体基板を形成したときにも閉塞板１２１が基板から突出しすぎることを回避できるので、ある程度厚い閉塞板１２１を用いることができる。但し、この場合、この基板の凹部１０ａの深さは閉塞板１２１の厚さよりも浅く選定されていることか好ましい。例えば基板１０の厚さを１．２mmとし、基板凹部１０ａの深さを０．３mmとすると、閉塞板１２１の厚さを０．４mm程度にすることができる。

【００５８】また、上述した実施例において、図１８に示すように、閉塞板１２１と基板１０との接触部にＯリング、あるいはパッキングを取り付けることにより、基板１０と閉塞板１２１との間に光硬化性樹脂が侵入する

ことを防止することができ、これにより光硬化性樹脂の塗布むらや最終的に得られる光学記録媒体の外観不良を回避することができる。

【００５９】また、図１９に示すように、閉塞板１２１の側面をテーパー状にし、基板１０の中心孔１０ｈを埋め込んだときに、基板の中心孔１０ｈの側壁部と線接触させた状態とすると、基板１０と閉塞板１２１との間に隙間ができないため、光硬化性樹脂の侵入を回避することができる。

【００６０】本発明の光学記録媒体を構成する情報記録層１５の反射膜１４は、上述の実施例においては、Ａｌ蒸着膜により形成したが、本発明は、この例に限定されるものではなく、Ａｕ等の金属も適用することができる。

【００６１】また、上述した実施例においては、単層構造の光学記録媒体を作製する場合について説明したが、本発明は、上述の基板１０上に光硬化性樹脂３を塗布した後に情報記録層を構成する微細凹凸転写用のスタンパーを合致させる工程を追加して、その後、さらに上述した実施例と同様に光透過層を形成させることにより、２層構造、あるいはそれ以上情報記録層を有する多層構造の光学記録媒体を作製する場合においても、適用することができる。

【００６２】

【発明の効果】本発明によれば、光学記録媒体の情報記録層からの記録情報の読み出し、あるいは情報の書き込みを行う光透過層を液状光硬化性樹脂を光硬化させることにより形成する場合に、基板の中心に滴下して回転延伸させる工程を経て形成させることができるため、光透過層をを薄く、かつ均一な厚さに形成することができ、光学記録媒体の高記録密度化を図ることができた。

【００６３】また、基板の回転により液状の光硬化性樹脂を延伸させると同時に光照射により光硬化性樹脂を硬化させることにより、光硬化性樹脂がその表面張力により最終的に得られる光透過層の厚さに分布が生じることを効果的に回避することができた。

【００６４】また、基板の凹部の外周を、基板上に形成された情報記録層を構成する微細凹凸の最内周よりも内側に形成することにより、情報記録層に欠陥を生じることを回避することができた。

【００６５】また、基板の凹部を埋め込むための閉塞板の厚さを、基板の凹部の深さと略同一か、あるいは凹部の深さよりも厚く形成させることにより、基板に閉塞板を埋め込んだ状態において、基板の中心部が窪んだ状態となることを回避することができ、これにより、液状光硬化性樹脂を塗布、延伸する際に、液状光硬化性樹脂が基板中心部に溜まり、延伸が妨げられる状態となることを回避することができた。

【００６６】また、基板の凹部の深さを０．３（ｍｍ）以下に選定することにより、基板の凹部を埋め込む閉塞板２１の厚さを薄く設定することができ、これにより、基板の中心孔を容易に打ち抜けるようにすることができた。

【００６７】また、基板の中心孔に嵌め込み、これを閉塞する閉塞板として磁性を有する材料を用いて合体基板の回転中に閉塞板の脱着を行うことにより、光学記録媒体の作製工程をより簡易かつ迅速に行うことができるようになった。

【００６８】また、本発明の光学記録媒体の製造装置によれば、光学記録媒体を構成する光透過層を、薄くかつ均一な厚さに、簡易かつ迅速に形成することができた。

【図面の簡単な説明】

【図１】本発明方法により作製した光学記録媒体の概略断面図を示す。

【図２】基板作製装置の概略図を示す。

【図３】基板の概略断面図を示す。

【図４】合体基板の作製工程図を示す。

【図５】光透過層の作製工程図を示す。

【図６】光透過層の作製工程図を示す。

【図７】基板の中心孔を打ち抜き作製する工程図を示す。

【図８】基板の中心孔を打ち抜き作製する他の例の工程図を示す。

【図９】本発明方法による光学記録媒体の他の例の一製造工程図を示す。

【図１０】本発明方法による光学記録媒体の他の例の一製造工程図を示す。

【図１１】本発明方法による光学記録媒体の他の例の一製造工程図を示す。

【図１２】本発明方法による光学記録媒体の他の例の一製造工程図を示す。

【図１３】本発明方法による光学記録媒体の他の例の一製造工程図を示す。

【図１４】本発明方法による光学記録媒体の他の例の一製造工程図を示す。

【図１５】本発明方法による光学記録媒体の製造装置の概略図を示す。

【図１６】本発明方法による光学記録媒体の他の例の製造工程図を示す。

【図１７】本発明方法による光学記録媒体の他の例の製造工程図を示す。

【図１８】本発明方法による光学記録媒体の他の例の製造工程図を示す。

【図１９】本発明方法によるの光学記録媒体の他の例の作製工程図を示す。

【図２０】従来方法により作製した光学記録媒体の概略断面図を示す。

【図２１】従来方法による光学記録媒体の一製造工程図を示す。

【図２２】光硬化性樹脂の塗布開始位置の基板中心から

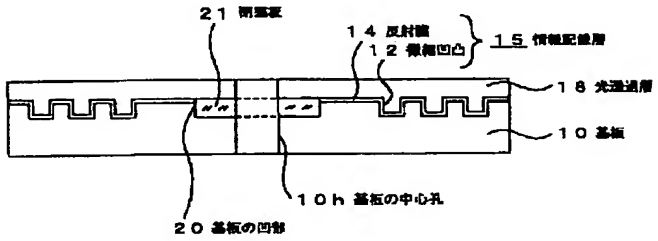
の距離と、光透過層の厚さとの関係図を示す。

【図２３】光硬化性樹脂を回転延伸させる際の基板の回転パターンを示す。

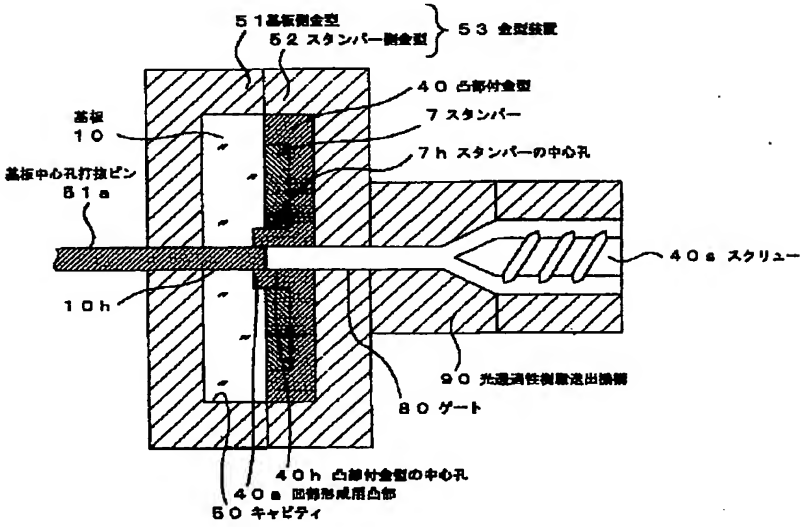
【符号の説明】

１，１０　基板、１ｈ，１０ｈ　基板の中心孔、２，１２　微細凹凸、３　光硬化性樹脂、４，１４　反射膜、５，１５　情報記録層、７　スタンパー、７ｈスタンパーの中心孔、８，１８　光透過層、９　ノズル、２０　基板の凹部、２１，１２１　閉塞板、２２　光源、２５，１２５　合体基板、３１　光硬化性樹脂の塗布開始位置が５（ｍｍ）のときの光透過層の厚さの分布、３２　光硬化性樹脂の塗布開始位置が１０（ｍｍ）のときの光透過層の厚さの分布、３３　光硬化性樹脂の塗布開始位置が１５（ｍｍ）のときの光透過層の厚さの分布、３４光硬化性樹脂の塗布開始位置が２０（ｍｍ）のときの光透過層の厚さの分布、３５　光硬化性樹脂の塗布開始位置が２５（ｍｍ）のときの光透過層の厚さの分布、４０　凸部付金型、４０ａ　凹部形成用凸部、４０ｈ　凸部付金型の中心孔、４０ｓ　スクリュー、５０　キャビティ、５１　基板側金型、５１ａ　基板中心孔打抜ピン、５２　スタンパー側金型、５３　金型装置、７０，７１　中心孔打ち抜き機、８０　ゲート、９０　光透過性樹脂送出機構、１００　水平基台、１０１　中心軸、１０２　電磁石、１２１ａ　突出支持部、１３０　搬送手段、１３１　回転軸部

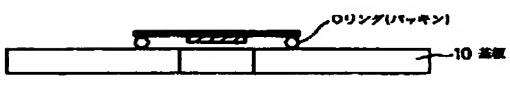
【図１】



【図２】



【図１８】



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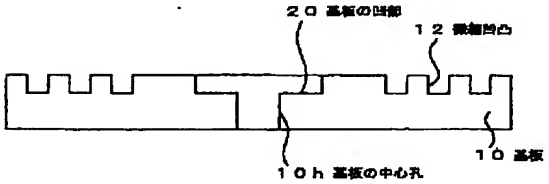

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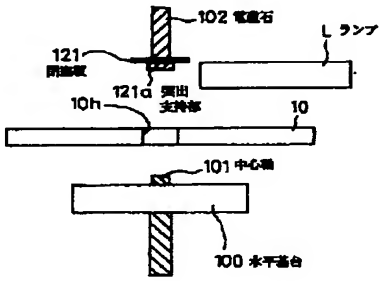
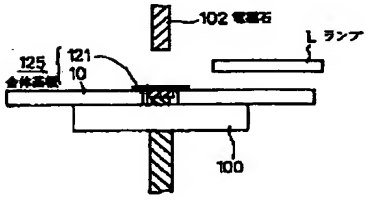


【図１０】



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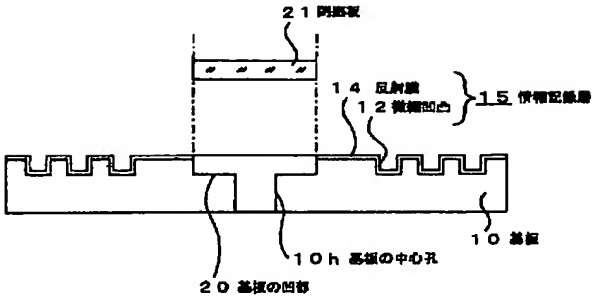

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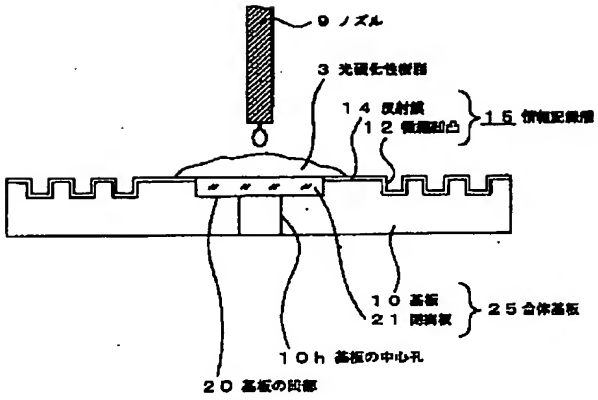

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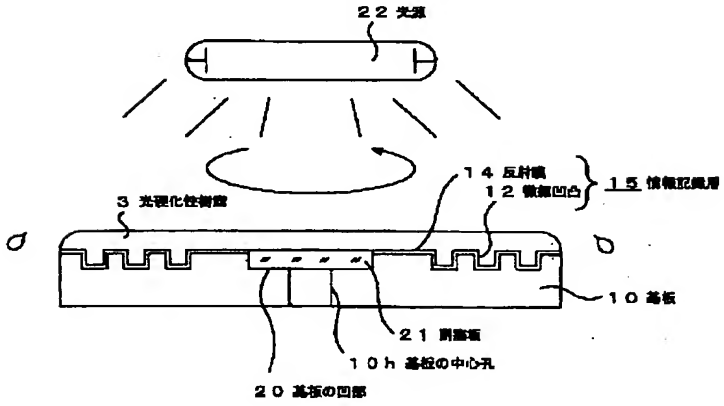
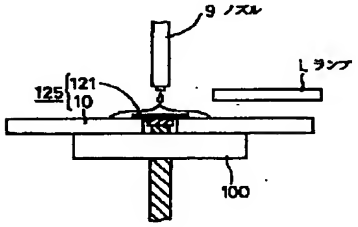


【図１１】



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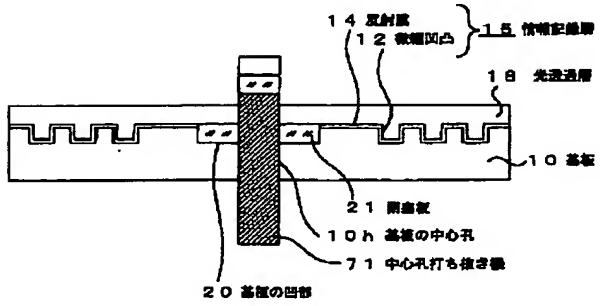

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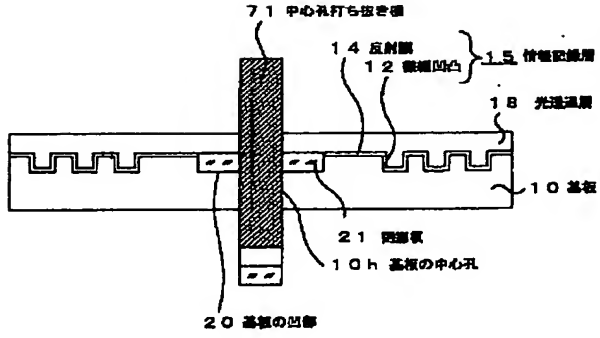
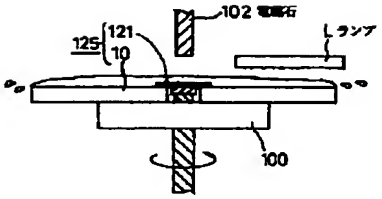


【図１２】



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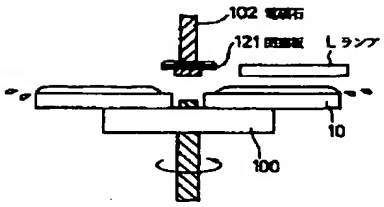

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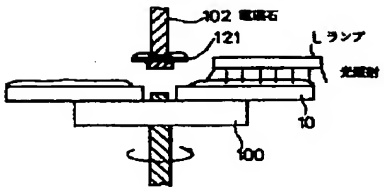
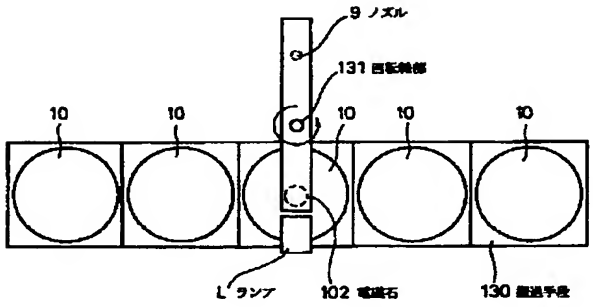


【図１５】



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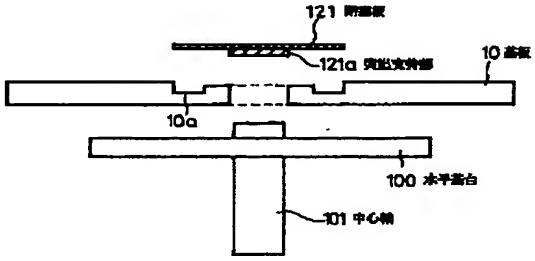

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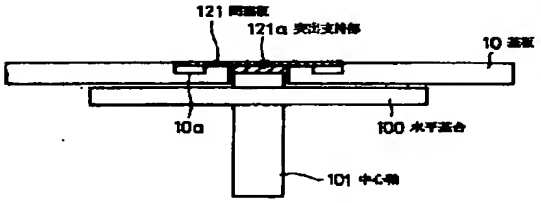

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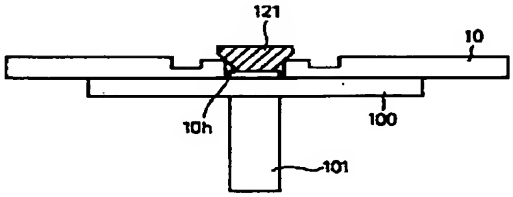
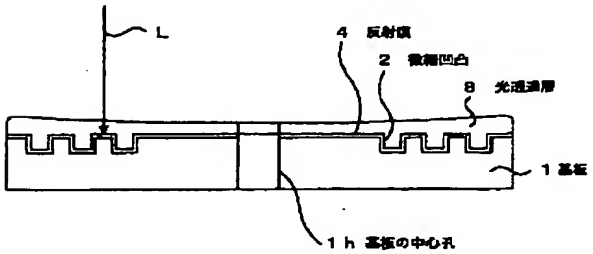
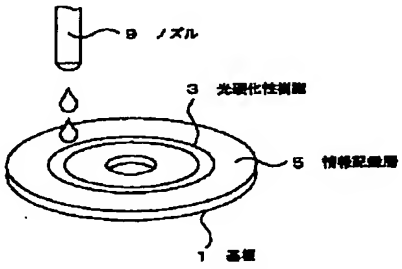


【図２０】



【図２１】



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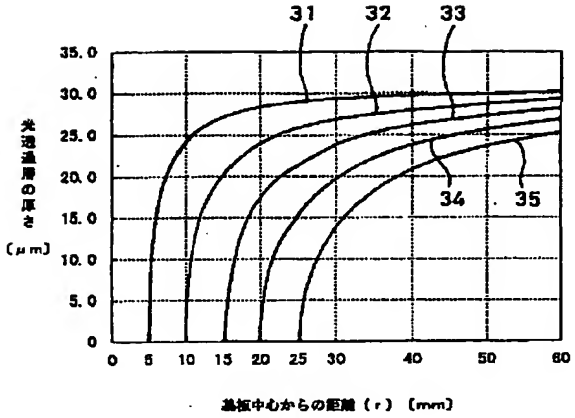
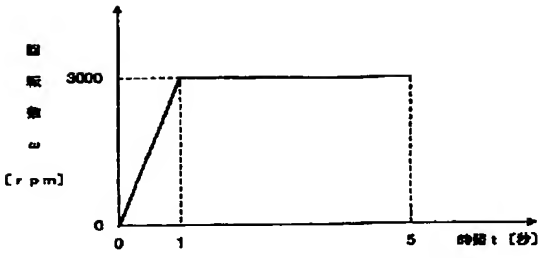

31
32
33
34
35
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
0
5
10
15
20
25
30
40
50
60
光透過層の厚さ
(μm)
基板中心からの距離（r）(mm)

【図２３】


3000
0
0
1
5
(rpm)
時間 t (秒)